

FOUR NEW SPECIES OF COSTA RICAN *CERAEOCHRYSA* (NEUROPTERA: CHRYSOPIDAE)

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Abstract.—Four new species of Costa Rican *Ceraeochrysa* are described, and compared to closely related congeneric species.

Resumo.—Cuatro nuevas especies de *Ceraeochrysa* costaricense son descrito, y comparadas a unas especies cerca relativas congenericas.

Key Words.—Insecta, Neuroptera, Chrysopidae, *Ceraeochrysa*, Costa Rica.

The genus *Ceraeochrysa* was erected by Adams (1982) for 24 species of green lacewings distributed from southern Canada to Argentina. More recently, Brooks and Barnard (1990) included 40 valid species in this genus. They are primarily tropical, and some species may be valuable as biological control agents in plantation ecosystems (Adams & Penny 1987). *Ceraeochrysa* species are medium-sized (forewing length 9 to 15 mm) pale green lacewings that usually bear red or black markings on the pronotum and, less commonly, on the labial palps. An elongate gonapsis, the presence of entoprocesses, a decurved mediuncal apex, and the absence of a tignum are diagnostic traits of the male genitalia.

In a recent study of the Neuroptera fauna of Costa Rica, 17 species of *Ceraeochrysa* were examined, five of which are undescribed. Four of the latter species are described here. The available material of the fifth species, a single female, is insufficient to warrant its description at the present time.

MATERIALS AND METHODS

The apical part of the abdomen of each specimen was broken off with fine forceps and macerated in 10% KOH, stained in Chlorazol Black E, and preserved in a glycerin-filled microvial pinned beneath the rest of the specimen. Wing tracings were made with a Ken-a-vision microprojector from temporary wing mounts on microscope slides. Following illustration, wings were glued to cards pinned beneath the appropriate specimen. Body and genital drawings were made with the aid of a micrometer grid. Morphological terminology follows Adams & Penny (1987).

CERAEOCHRYSA NIGRIPEDIS PENNY, NEW SPECIES

Types.—Holotype, male: COSTA RICA. PUNTARENAS: Monteverde Biological Reserve, La Casona Station, UTM map coordinates L-N 253250, 449700, 1520 m, Nov 1991, N. Obando. Bar Code: INBIO, CR1000, 602561. Holotype deposited: Instituto de Biodiversidad (INBIO), Santo Domingo de Heredia, Costa Rica. Allotype female, same data as holotype, except Bar Code: INBIO, CR1000, 602560; deposited California Academy of Sciences, San Francisco, California.

Description.—*Head* (Fig. 3). Vertex, frons, clypeus, genae, labrum, and palpi pale yellow. Antennal scape, pedicel, and flagellum pale, without markings; flagellum slightly shorter than forewing length.

Thorax (Fig. 2). Pronotum wider than long, pale yellow, immaculate, with four small indentations. Meso- and metanota pale yellow, with a pair of round dark brown spots at the suture between prescutum and scutum on mesonotum and laterally on scutum of metanotum. Pleural and sternal areas pale yellow. Each leg pale yellow, except apical tarsomere contrastingly dark brown. *Wings* (Fig. 1). Forewing length—12.7 mm. Longitudinal veins pale green; crossveins and apical twiggings dark brown, except for apical costal crossveins. Gradate veins dark with strong infuscation of membrane along inner series. Seven inner and eight outer gradate veins. Very dark markings at apex of 1A, posterior cubitus, and cua-cup crossvein, forming a point of visual attraction on the wing. Hindwing length—11.5 mm. All veins pale green, except for most gradate veins dark. Six inner and seven outer gradate veins. *Abdomen*. Pale yellow. Female subgenitale (Fig. 4) broadly heart-shaped, with deep central cleft. Spermatheca strongly arched anterior to spermathecal ducts. Male ectoproct + tergite 9 (Fig. 5) short and broad, with scattered setae with thickened bases; dorsal apodeme simple, reaching callo cerci, without ventral lobe. Sternite 9 with broad, latero-dorsal subapical projection; numerous setae with thickened bases. Gonarcus (Figs. 7–8) medially narrow, with broad lateral plates. Ventral arms of gonarcus laterally embedded in simple, membranous gonosaccus. Entoprocesses of gonarcus-absent. Mediuncus very long, narrow, straight, with decurved apical point. Gonapsis (Fig. 6) elongate, with slightly upturned and expanded, smoothly rounded apex.

Diagnosis.—No other species of *Ceraeochrysa* has this spotting pattern on the thorax, nor the darkened apical tarsal segment. *Ceraeochrysa nigripedis* appears to be most closely related to *C. tauberæ*, with which it shares an elongate, straight arcessus and dark area of visual attraction on the forewing at 1A. They differ by *C. nigripedis* having the aforementioned characteristics, in addition to a much longer ventral projection of the gonarcus and no strong gonosetae on the gonosaccus.

Etymology.—This species is named for the distinctively dark apical tarsal segments.

Material Examined.—In addition to holotype and allotype, one additional female from INBIO: same data as holotype, except collected Jul 1992.

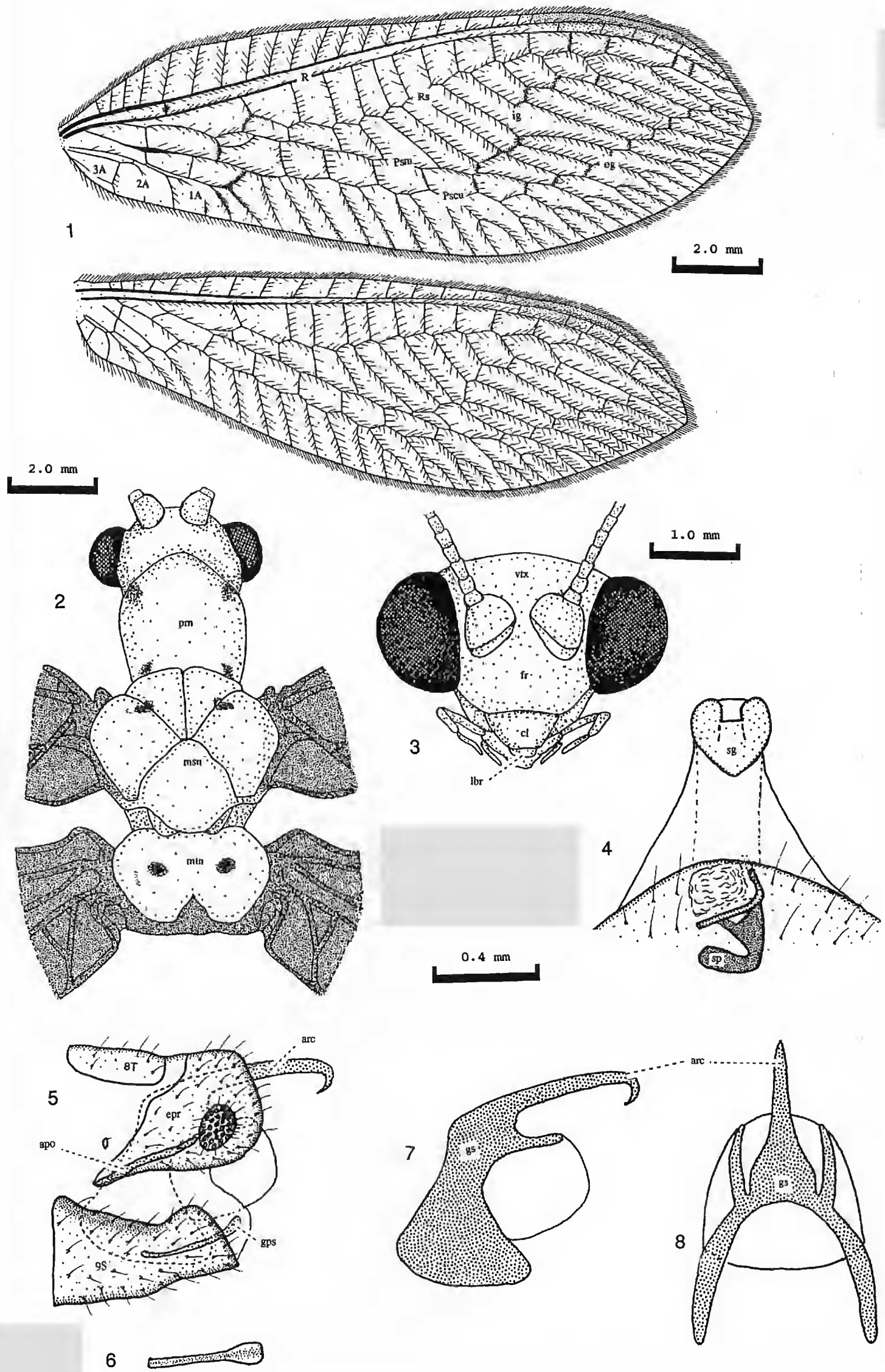
CERAEOCHRYSA INBIO PENNY, NEW SPECIES

Types.—Holotype, male: from COSTA RICA. CARTAGO: La Amistad Biosphere Reserve, Guayabo National Monument, UTM grid coordinates L-N 217400, 570000, 1100 m, Jul 1994, G. Fonseca. Bar code: INBIO, CR1001, 887909. Holotype deposited: Instituto de Biodiversidad (INBIO), Santo Domingo de Heredia, Costa Rica.

Description.—*Head* (Fig. 10). Vertex, frons, clypeus, genae, labrum, and palpi bright yellow. Antennal scape and pedicel bright yellow, with scape bearing longitudinal, mid-dorsal brown stripe. Antennal flagella missing. *Thorax* (Fig. 11). Pronotum wider than long; pale green with dark brown spots in antero-lateral and postero-lateral corners of sclerite. Meso- and metanota pale yellow, immaculate, except for a pair of small, elongate, brown spots on mesonotum along suture between prescutum and scutum. Pleural and sternal areas pale green, immaculate. Legs pale green, becoming gradu-

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Figures 1–8. *Ceraeochrysa nigripedis*, NEW SPECIES. Figure 1. Right wings. Figure 2. Head and thorax, dorsal view. Figure 3. Head, frontal view. Figure 4. Female genitalia, ventral view. Figure 5. Apex of male abdomen, lateral view. Figure 6. Gonapsis, dorsal view. Figure 7. Male genitalia, lateral view. Figure 8. Male genitalia, dorsal view. Abbreviations: arc = arcessus, cl = clypeus, epr = tergite 9 + ectoproct, fr = frons, gps = gonapsis, gs = gonarcus, ig = inner gradate veins, lbr = labrum, msn = mesonotum, mtn = metanotum, og = outer gradate veins, prn = pronotum, Pscu = pseudocubitus, Psm = Pseudomedia, Rs = radial sector, sg = subgenitale, sp = spermatheca, vtx = vertex, 1A = third anal vein, 2A = second anal vein, 3A = third anal vein, 8T = tergite 8.



ally dark yellow on tarsi. *Wings* (Fig. 9). Forewing length—17.3 mm. Longitudinal veins pale green with dark brown crossveins, except apical costal and radial crossveins pale. Gradate crossveins dark, with some membrane infuscation along inner gradates; nine inner and ten outer gradate veins. Costa slightly swollen and darkened basad of apex of 3A. Hindwing length—15.0 mm. Longitudinal and crossveins completely pale green, immaculate. Eight inner gradate and nine outer gradate veins. *Abdomen*. Tergites dark green, with pair of small dark spots at posterior margin of tergites 2 and 3. Sternites pale yellow. Male terminalia: ectoproct + tergite 9 elongate, without a ventral lobe (Fig. 12); dorsal apodeme forked, with straight, posterodorsally branch apically forked around callo cerci; ventral fork posteroventrally directed, elongate, straight, heavily-sclerotized projection terminating in a small, acute, ventral point. Sternite 9 apically tapering sharply to ventral point; bearing numerous setae with expanded (stalked) bases. Gonarcus (Figs. 14–15) narrow medially, tapering to relatively elongate, narrow, lateral plates. Entoprocesses elongate, evenly tapering points extending about 0.67 length of arcessus. Arcessus a broad, flat plate, terminating in a short, decurved median hook, and a pair of smaller bilaterally symmetrical lateral points. Ventral arms of gonarcus embedded in and supporting lateral margins of gonosaccus. Gonosaccus lacking gonosetae and gonocristae; membrane between gonosaccus and sternite 9 bearing a broad field of small gonocristae, giving membrane a rugose appearance. Gonapsis elongate, upturned for posterior fifth, terminating in unexpanded, smoothly rounded apex (Fig. 13).

Diagnosis.—*Ceraeochrysa inbio* is a part of the *cincta* species group, all of which have a caudally recurved ventral fork of the dorsal apodeme and a field of gonocristae between the gonosaccus and ninth sternite in males. *Ceraeochrysa inbio* differs from *C. claveri* (Navás) in the latter's distinctive gonapsis, which terminates in a broad, U-shaped bifurcation, and in the lack of pronounced entoprocesses. *Ceraeochrysa cincta* (Schneider) also has much shorter entoprocesses and a shorter, more highly curved dorsal apodeme. *Ceraeochrysa arioles* (Banks) has a much larger, more recurved apex of the ninth sternite. *Ceraeochrysa inbio* is very similar to *C. caligata* (Banks), except for the former's uniquely spotted pronotum and small apical point on the male ninth sternite.

Etymology.—This species is named after the Instituto de Biodiversidad, commonly referred to as "INBIO", to recognize the hard work and pioneering methods that its staff has instigated to increase knowledge about the biodiversity of Costa Rica.

Material Examined.—See Type.

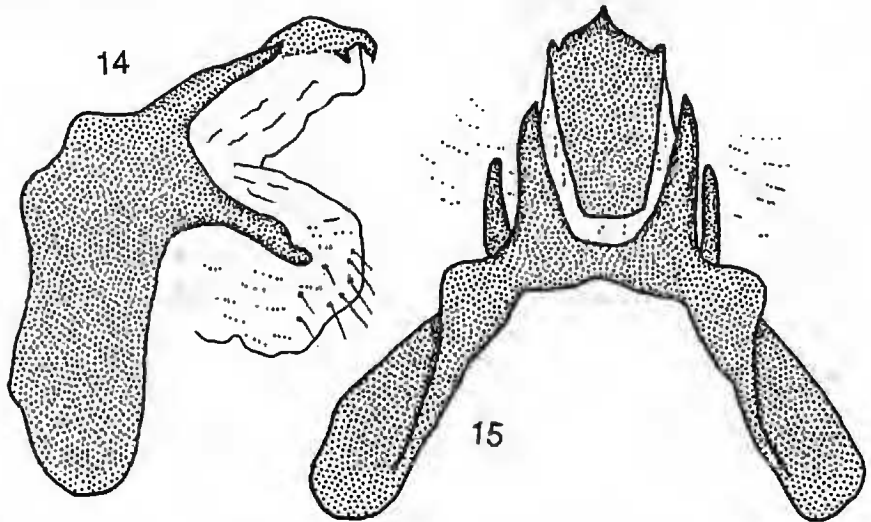
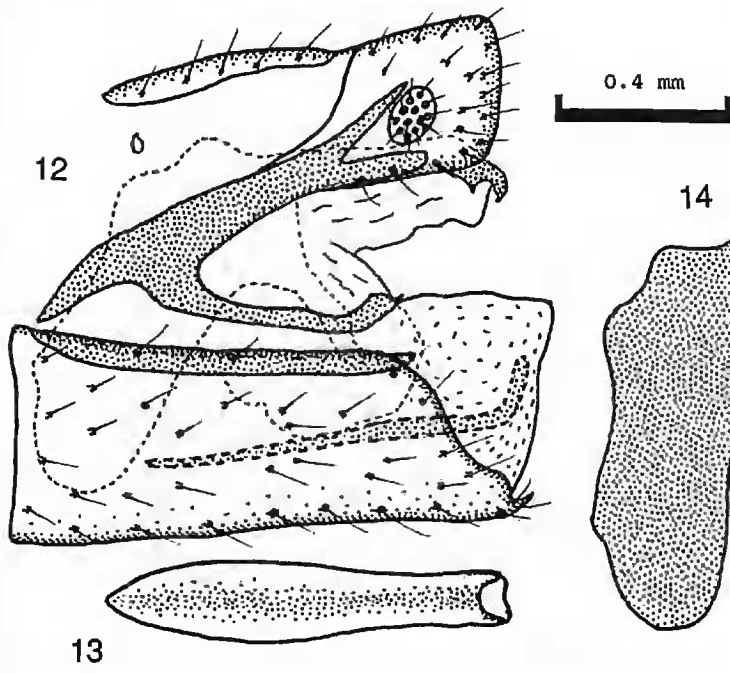
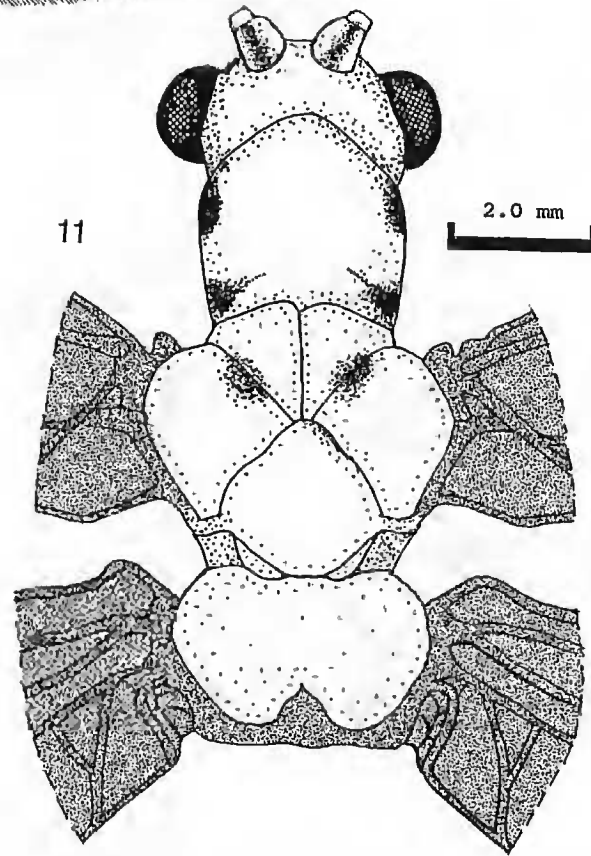
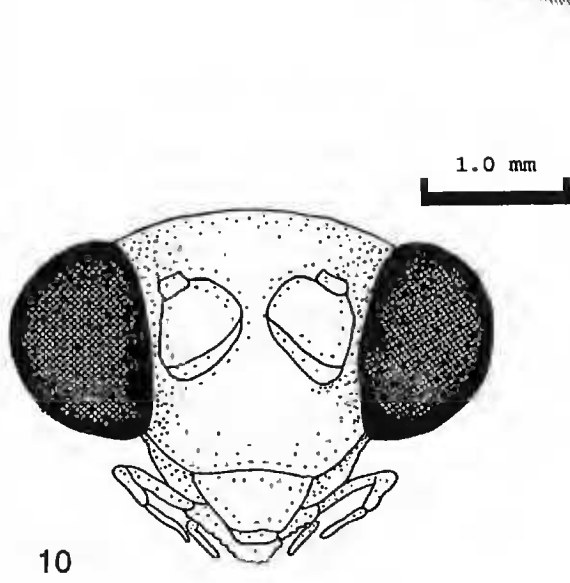
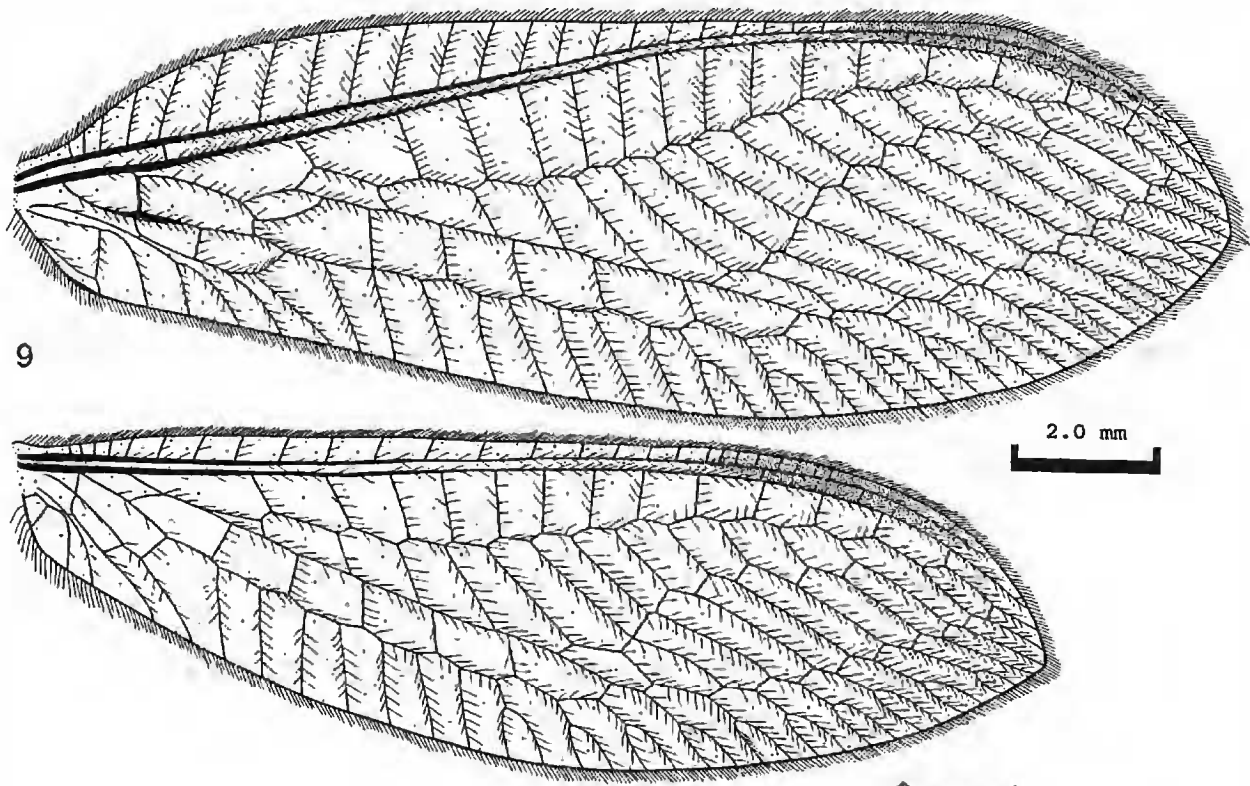
CERAEOCHRYSA COSTARICENSIS PENNY, NEW SPECIES

Type.—Holotype, male: COSTA RICA. PUNTARENAS: Los Alturas, 1360 m, 27 Feb 1991, Helen Sparrow. Holotype deposited: Instituto de Biodiversidad (INBIO), Santo Domingo de Heredia, Costa Rica.

Description.—*Head* (Fig. 18). Vertex, frons, clypeus, genae, labrum, and palps bright yellow. Antenna slightly shorter than forewing length. Antennal scape suffuse orange dorsally, pale yellow ventrally; pedicel and flagellum pale yellow. *Thorax* (Fig. 17). Pronotum wider than long, pale green with pair of large reddish brown spots laterally. Smaller red brown spot on membrane under anterio-lateral margins on either side of pronotum. Meso- and metanota pale green, immaculate. Pleural and sternal areas pale green to pale yellow. Legs entirely pale green. *Wings* (Fig. 16). Forewing length—13.5 mm. Longitudinal veins pale green; crossveins dark, except for apical costal crossveins. Four

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Figures 9–15. *Ceraeochrysa inbio*, NEW SPECIES. Figure 9. Right wings. Figure 10. Head, frontal view. Figure 11. Head and thorax, dorsal view. Figure 12. Apex of male abdomen, lateral view. Figure 13. Gonapsis, dorsal view. Figure 14. Male genitalia, lateral view. Figure 15. Male genitalia, dorsal view.



inner and seven outer gradate veins in parallel series forming cells approximately twice as long as wide. Hindwing length—12.0 mm. Longitudinal and crossveins uniformly pale green. Three inner and seven outer gradate veins. Apex angulate. *Abdomen*. Pale green. Male ectoproct + tergite 9 (Fig. 19) elongate, with scattered chalazate setae; an acute posteroventral lobe supported by ventral lobe of dorsal apodeme. Sternite 9 tapering to apex bearing chalazate setae. Gonarcus (Figs. 21–22) narrow medially, and narrow, caudally-projecting flat plates laterally. Broad dorsal plate at medial part of gonarcus. Mediuncus laterally forming pair of elongate, upturned plates, which end in dorso-caudal acute point. Mediuncus with pair of small projections basally and an evenly decurved medial point apico-ventrally. Convolute field of small gonocristae on gonosaccus. Gonapsis (Fig. 20) relatively short, with subapical lateral arms and acute, upturned apical point.

Diagnosis.—This species is very closely related to *C. everes* (Banks), with which it shares a very distinctive dorsal hood medially on the gonarcus, upturned plate of the arcessus, and thickened setal bases at the apex of the ninth sternite. They differ in that *C. costaricensis* has two pairs of pronotal spots (not stripes), antennal bases pale (not infused with red), and apex of gonapsis simply upturned (not toothed dorsally with a ventral medial lobe).

Etymology.—This species is named after Costa Rica, in homage to all of the efforts that have been made to make known and conserve its fauna.

Material Examined.—See Type.

CERAEOCHRYSA TAUBERAE PENNY, NEW SPECIES

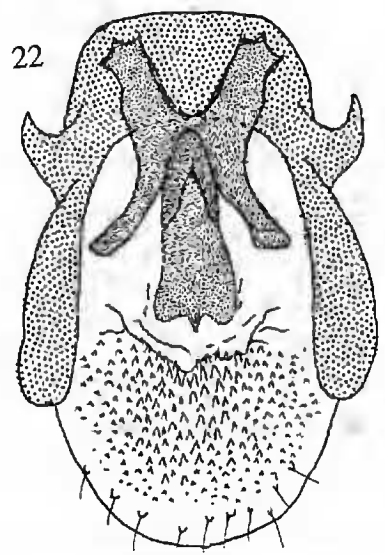
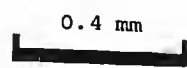
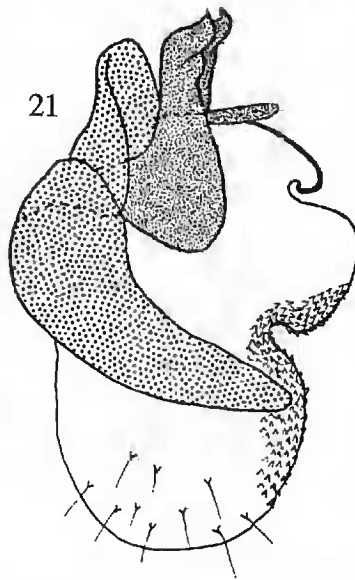
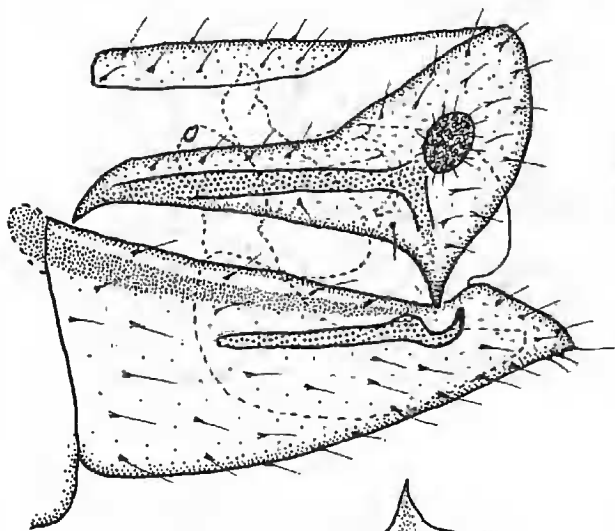
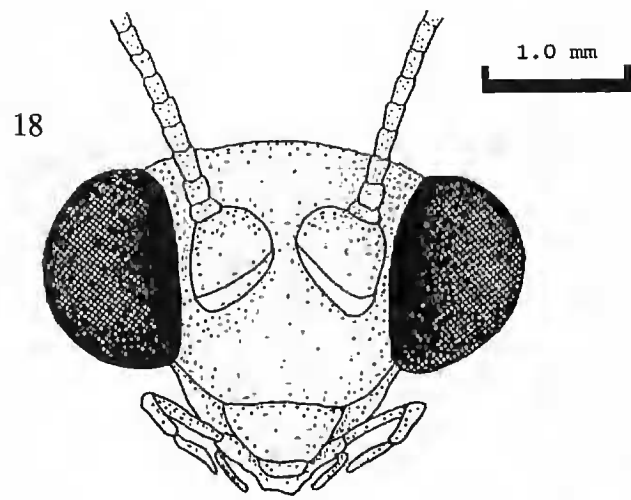
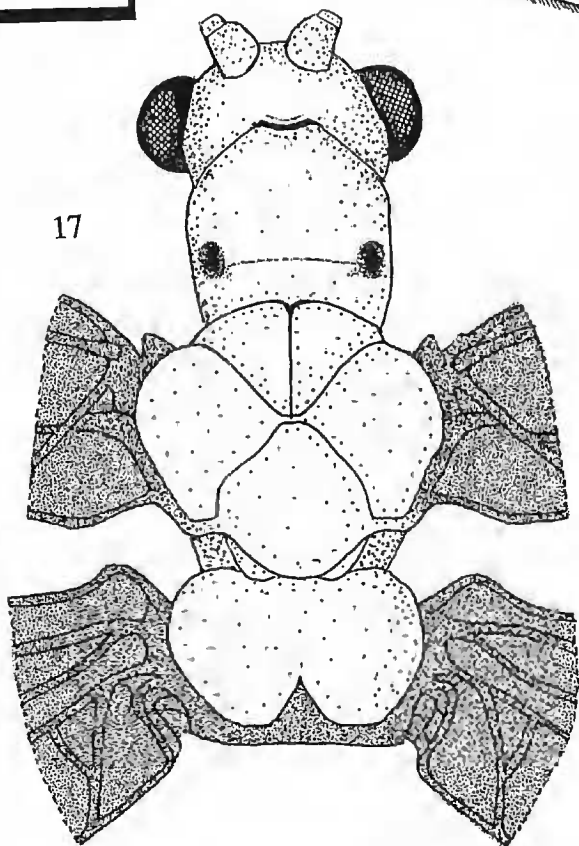
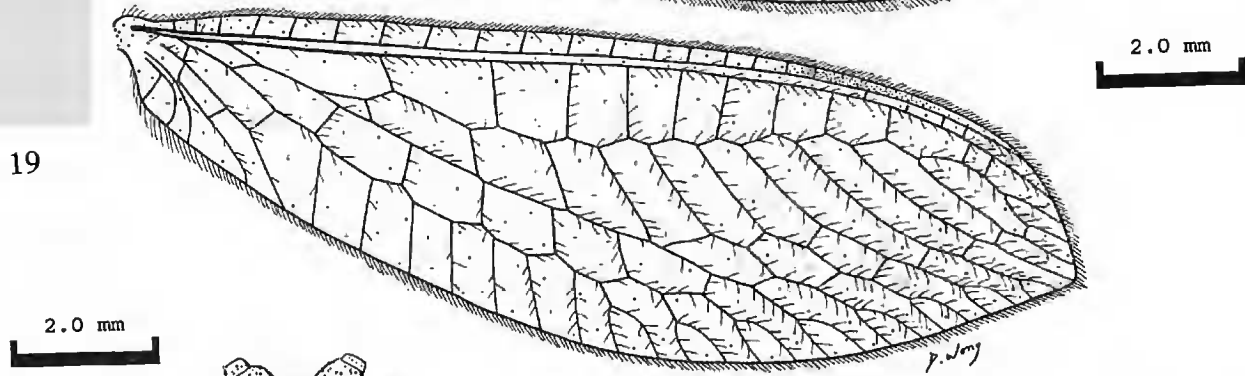
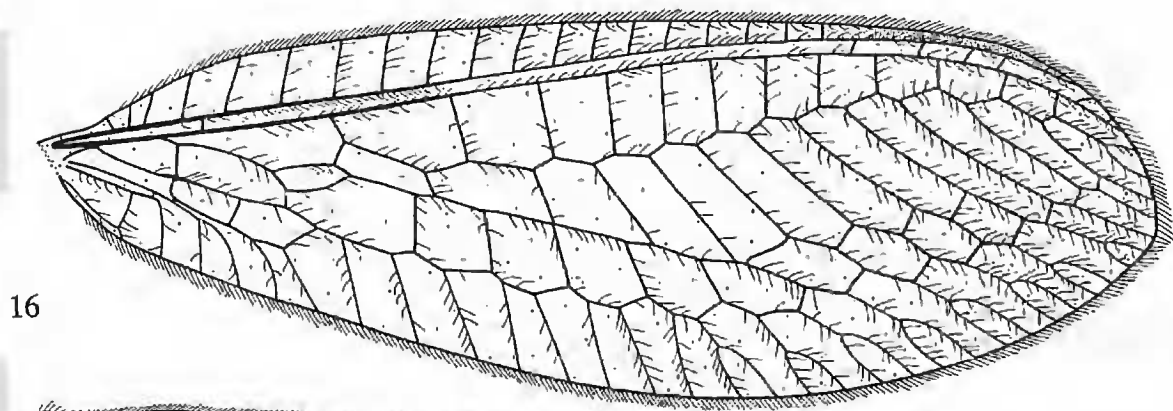
Type.—Holotype, male: COSTA RICA. *CARTAGO*: near Eslabón, 21 Dec 1994, C.A., M.J. and P.J. Tauber. Holotype deposited: Instituto de Biodiversidad (INBIO), Santo Domingo de Heredia, Costa Rica.

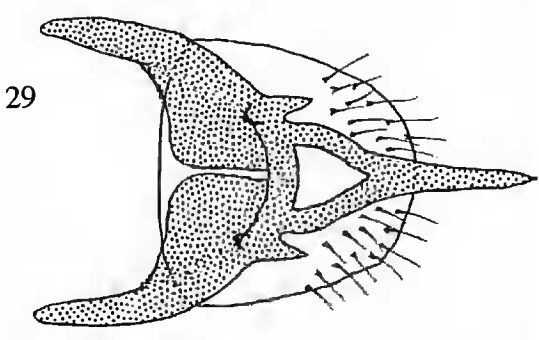
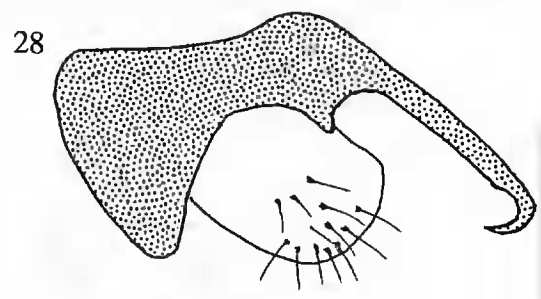
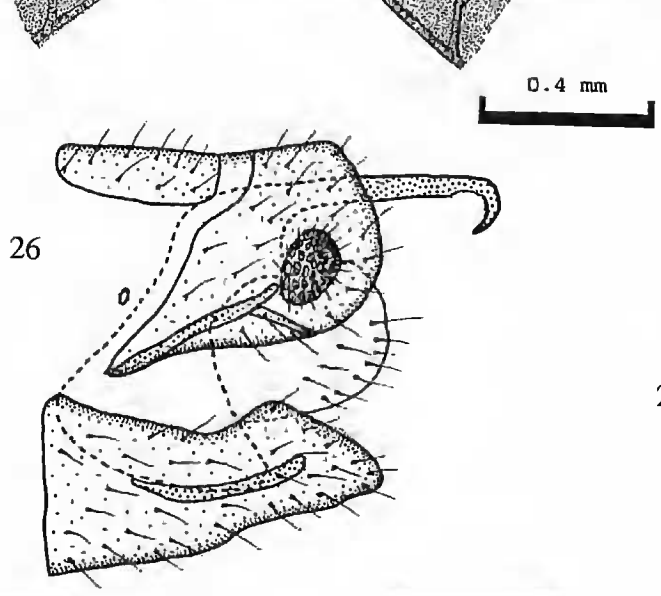
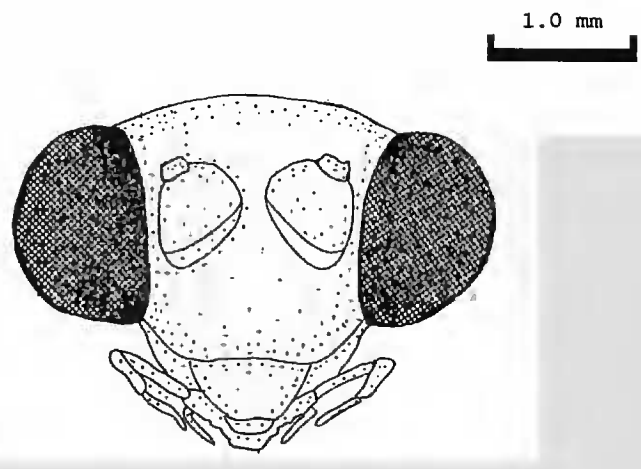
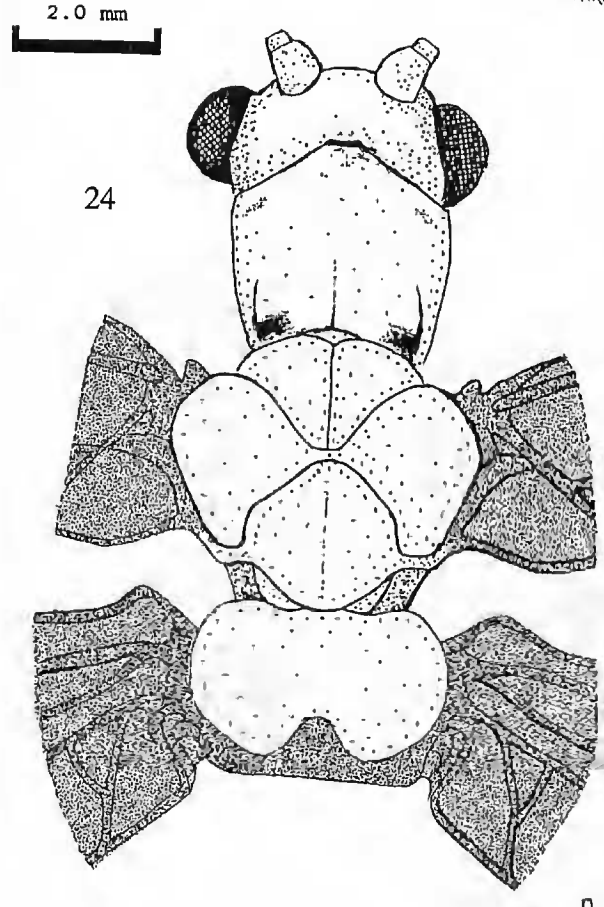
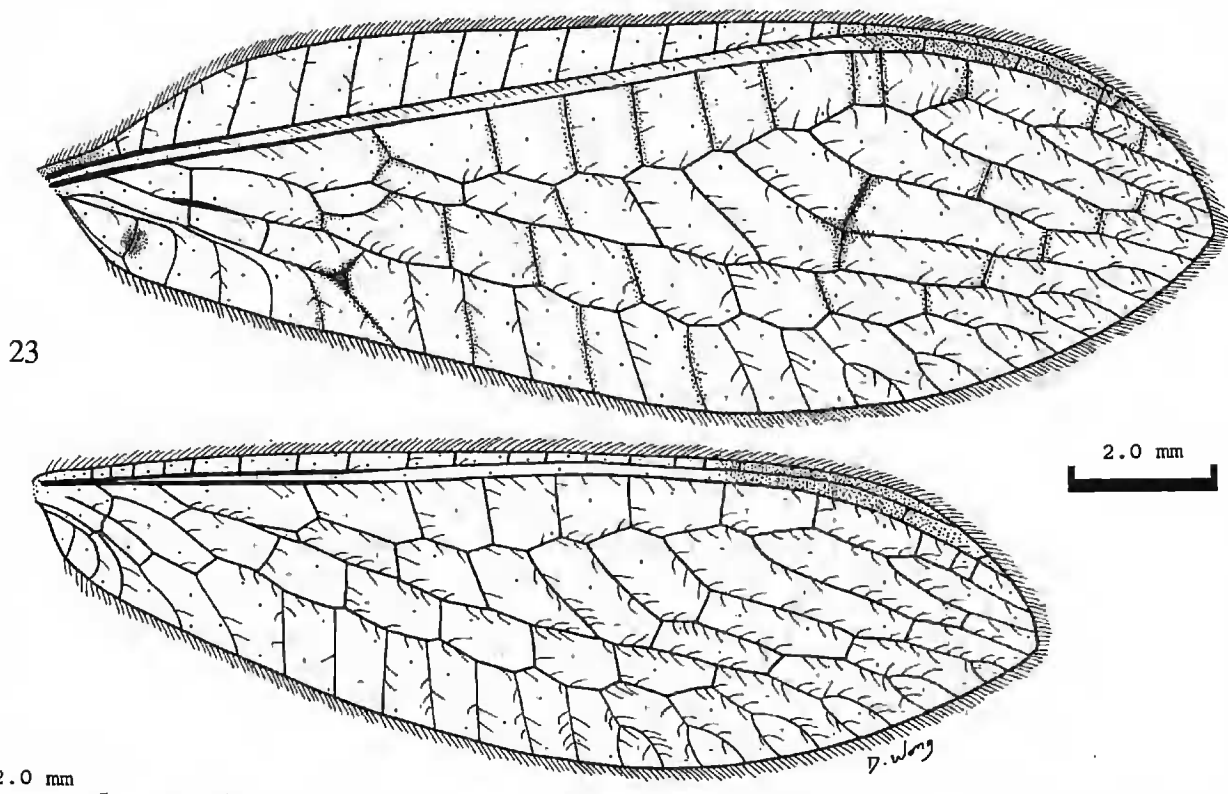
Description.—*Head* (Fig. 25). Vertex, frons, clypeus, genae, labrum, and palps bright yellow. Antennal scape and pedicel bright yellow. Antennal flagella missing. *Thorax* (Fig. 24). Pronotum as wide as long, pale yellow, with faint indications of darker markings at antero-lateral and postero-lateral margins. Meso- and metanota entirely pale green. Pleural and ventral surfaces of pterothorax pale yellow, immaculate. Legs pale yellow, changing to pale brown on tarsi. *Wings* (Fig. 23). Forewing length—10.0 mm. Longitudinal veins pale green, crossveins and apical twiggings brown. Three inner and four outer gradate veins present, dark brown with extensive infuscation of membrane adjacent to veins. Two additional areas of forewing heavily infuscated: apex of CuP and adjacent crossveins, and 2A-3A crossvein. Hindwing length—8.8 mm. Apex angulate. All longitudinal and crossveins entirely pale green. Two inner and four outer gradate veins. *Abdomen*. Entirely green. Male ectoproct + tergite 9 (Fig. 26) short, broadly ovate, only slightly extended ventrally, bearing scattered chalazate setae. Dorsal apodeme apically forked around callo cerci, but without ventral projecting lobe. Sternite 9 elongate, notably narrowed at mid-length, bearing scattered stalked setae. Gonarcus (Figs. 28, 29) formed by two very broad lateral plates which almost fuse along midline. Entoprocesses poorly developed as short, pointed lobes caudally and tiny points anteriorly. Ventral lobes of gonarcus absent. Mediuncus elongate, straight, tapering to apical decurved point. Gonosaccus bearing numerous gonosetae. Gonapsis (Fig. 27) elongate, apically forked, with both forks apically rounded.

Diagnosis.—This species appears most closely related to *C. nigripedis*, in part due to the long, straight arcessus and shape of the male ectoproct and ninth sternite. There is also a similar area visual attraction on the forewing at the apex of

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Figures 16–22. *Ceraeochrysa costaricensis*, NEW SPECIES. Figure 16. Right wings. Figure 17. Head and thorax, dorsal view. Figure 18. Head, frontal view. Figure 19. Apex of male abdomen, lateral view. Figure 20. Gonapsis, dorsal view. Figure 21. Male genitalia, lateral view. Figure 22. Male genitalia, caudal view.





CuP. Interestingly, there is a second illusory maculate area; *Ceraeochrysa nigripedis* has a pair of dark spots laterally on the metanotum, while in *C. tauberae* the forewing 2A–3A crossvein spot reposes over much the same metanotal area when the wings are at rest—forming the illusion of a metanotal spot in this species as well. These species also differ in that *C. tauberae* has a very wide gonarcual arch (not narrow), and numerous gonosetae on the gonosaccus (not smooth membrane).

Etymology.—This species is named after Catherine A. Tauber, who is a noted authority on chrysopid biology and the taxonomy of their immature stages.

Material Examined.—See Type.

ACKNOWLEDGMENT

The author thanks Connie Yan, Victoria Saxe and Diane Wong for drawings of the head, thorax and wings of the four species. Kady and Maurice Tauber graciously donated the type specimen of *C. tauberae* to INBIO. Manuel Zumbado and the staff of INBIO provided many of the specimens studied, and Angel Solis provided access and equipment during visits to INBIO. I wish to thank George Gorman for logistical support within Costa Rica, as well as Helen Sparrow and Tom Sisk for providing assistance and logistical support at the Los Alturas Field Station during a collecting trip in 1991. Phillip A. Adams generously provided illustrations and background information about the genus *Ceraeochrysa*. The former chairman of the California Academy of Science's Entomology Department, Charles Griswold, provided funding and encouragement for the ongoing study of Costa Rican neuropterans, as did the California Academy of Sciences In-House Research Fund.

LITERATURE CITED

- Adams, P. A. 1982. *Ceraeochrysa*, a new genus of Chrysopinae (Neuroptera) (Studies in New World Chrysopidae, Part II). *Neuroptera International*, 2: 69–75. 12 figures.
- Adams, P. A. & N. D. Penny. 1987. Neuroptera of the Amazon Basin. Part 11a. Introduction and Chrysopini. *Acta Amazônica*, 15(1985): 413–479. 213 + 29 figures. 1 table.
- Brooks, S. J. & P. C. Barnard. 1990. The green lacewings of the world: a generic review (Neuroptera: Chrysopidae). *Bulletin of the British Museum of Natural History, Entomology*, 59: 117–286. 578 figures. 1 table.

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Figures 23–29. *Ceraeochrysa tauberae*, NEW SPECIES. Figure 23. Right wings. Figure 24. Head and thorax, dorsal view. Figure 25. Head, frontal view. Figure 26. Apex of male abdomen, lateral view. Figure 27. Gonopsis, dorsal view. Figure 28. Male genitalia, lateral view. Figure 29. Male genitalia, dorsal view.